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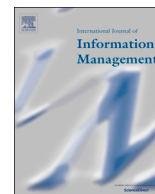
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# A multi-theory perspective on enablers of inter-organizational information and communication technology: A comparison of China and the Netherlands

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## ABSTRACT

Prior research on implementation of Information and Communication Technology (ICT) has predominantly been viewed from an intra-organizational perspective. This paper aims to extend this view by taking an inter-organizational perspective. By combining insights gained from two theoretical perspectives: transaction cost economics and relational exchange theory, we seek to understand enablers of inter-organizational ICT. Also, we investigate the effect of the socio-economic climate by comparing the country contexts of China and the Netherlands. We use survey data from 112 Dutch and 320 Chinese firms to test our hypotheses regarding potential differences between these countries. The paper helps in understanding the idea that enablers of inter-organizational ICT implementation could depend on country context. In the Dutch context, the transaction cost based perspective provides a valuable explanation for the use of Inter-organizational ICT, while in the Chinese context, both transaction cost economics, and relational exchange theory based perspectives help understand enablers for Inter-organizational ICT. Managers of global companies can use insights from this study to help guide their implementation of ICT strategy. Particularly, it may be noted that, despite a desire for uniformity and standardization, there might be different ways of implementing ICT that are attributed to country contexts.

## 1. Introduction

For multinational firms it is a key challenge to manage dissimilarities across different countries while executing a global strategy (Ghemawat, 2007). For instance, the field of International Business Studies has studied questions related to entry mode, investment decisions, governance of subsidiaries and financial structures (e.g., Brouthers & Hennart, 2007; Meyer, Estrin, Bhaumik, & Peng, 2009; Procher & Engel, 2018). However, operations related questions such as improving and restructuring global supply chain networks are far less investigated. For example, is it better to employ a 'one size fits all' approach, and apply a standardized approach to implementing improvement programs such as Enterprise Resources Planning, quality management or lean management (e.g. Netland, Schloetzer, & Ferdows, 2015), or is it better to be aware of probable differences between plants in different countries that might enable the success of such improvement programs? In this regard, a particular context of interest is the use of Inter-organizational Information and Communication Technology (IOICT) that intends to connect activities between a supplier and a

buyer. IOICT can be described as the technology-based infrastructure that connects supply chain processes of two or more firms (Chong & Bai, 2014). Successful use of IOICT could depend on characteristics of the relationship between a buyer and a supplier (Giotopoulos, Kontolaimou, Korra, & Tsakanikas, 2017) as embedded in contextual, country-related factors (e.g., Wiengarten, Pagell, Ahmed, & Gimenez, 2014). Consequently, for global companies, the implementation of IOICT in their whole network could pose specific challenges, as they need to balance between choosing one standard approach for all countries versus considering country specific differences and tailoring strategies according to country specific factors. The current paper aims to resolve this challenge, and help answer related questions for companies operating globally.

In general, existing research suggests that Information and Communication Technology (ICT) improves supply chain performance (Pigni, Ravarini, & Saglietto, 2010; Zhang, Van Donk, & Van der Vaart, 2011). Although Zhang, Van Donk and Van der Vaart (2016) show that inter- and intra-organizational ICT do so differently due to their distinctive characteristics, the relatively abundant literature on enablers of

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IOICT mostly ignores such differences (e.g., [Hernandez-Ortega, Serrano-Cinca, & Gomez-Meneses, 2014](#)). Typically, as [Mirkovski, Lowry and Feng \(2016\)](#) also indicate, existing studies on IOICT adoption and their enablers focused on well-documented technological, environmental and organizational factors grounded in the well-established ‘technology-organization-environment’ and ‘diffusion of innovation’ frameworks that overlook the influence of inter-organizational relationships. Moreover, these authors also comment that most papers concern a single-country analysis. However, with more mature internet based technologies being available, the above-mentioned factors and intra-organizational frameworks are less relevant ([Chong, Ooi, Lin, & Tang, 2009](#)). Consequently, a focus on the nature of the inter-organizational relationship to investigate such internet based IOICT implementation ([Chou, 2018](#)), puts emphasis on the relationship’s country specific context ([Tan & Ludwig, 2016](#); [Wiengarten et al., 2014](#)). Specifically, cross-country differences are important for strategy implementation ([Meyer et al., 2009](#)) and their associated levels of technological capabilities directly affect e-business implementation ([Bordonaba-Juste, Lucia-Palacios, & Polo-Redondo, 2012](#); [Zhu, Kraemer, & Dedrick, 2004](#)). Usually, in an inter-organizational setting, relevant country specific factors could relate to socio-economic factors such as national culture, social standing, economic freedom and development ([Griffith & Myers, 2005](#); [Livermore & Rippa, 2011](#)). The current debate offers an interesting, but unsolved problem for managers and for researchers: should global companies use global standards and procedures to achieve effective implementation of IOICT, or should they adapt such procedures to suit country-specific characteristics ([Melville, Kraemer, & Gurbaxani, 2004](#)). Therefore, our main research question is: do inter-organizational mechanisms that help explain IOICT implementation vary across different country contexts? We seek to answer this question using empirical data from The Netherlands and China, as further explained below.

To answer this research question, we need an appropriate theoretical framework involving enablers of IOICT. IOICT can be characterized as enabling smooth transactions between different organizations, which needs considerable resources and relationship building. As such it forms a typical example of blurred boundaries across organizations or an “intermediate between markets and hierarchies” ([Joshi & Stump, 1999](#), p. 334). Typically, these “new governance mechanisms require exchange partners to be committed to each other and refrain from behaving opportunistically against each other (*Ibid.*, p. 335). For IOICT implementation, a company would not only need its partner to commit resources towards adoption and not act opportunistically in the adoption process ([Hertwig, 2012](#)), but also to strengthen bonds with a partner through effective relational governance mechanisms ([Kim, Ryoo, & Jung, 2011](#)). These theoretical considerations suggest that both transaction cost and relational perspectives are relevant when studying IOICT implementation. [Cao and Lumineau \(2015\)](#) and recently [Chi, Zhao and George \(2017\)](#) presented arguments that firms often simultaneously use contractual and relational governance mechanisms to organize their relationships with supply chain partners. This joint perspective has also been applied in other settings such as product development collaboration, project management, and supply chain management ([Benítez-Ávila, Hartmann, Dewulf, & Henseler, 2018](#); [Bstieler & Hemmert, 2015](#); [Huang & Chiu, 2018](#)). Thus, by following the above research studies, this study also applies a combination of the transaction cost and the relational perspective as joint theoretical lens to understand the mechanisms that drive IOICT implementation. Moreover, given that our focus is on different countries, our joint perspective is specifically appropriate as earlier studies also suggested that formal and relational governance have advantages and disadvantages in situations characterized by different types of uncertainties as related to specific country characteristics ([Brouthers & Hennart, 2007](#); [Carson, Madhok, & Wu, 2006](#)).

Empirically, this study builds on original data gathered in two rather different countries employing the same questionnaire to explore

the influence of country context. We chose the countries of the Netherlands and China because of their relative differences in sizes, political and economic systems, and socio-cultural factors, as examples of countries with relatively different socio-economic systems. The Netherlands has a population of 17 million and China one of approximately 1.4 billion. According to the World Bank<sup>1</sup>, per capita GDP (gross domestic product) for the Netherlands is \$ 53,024 in 2018 while for China it is \$ 9,770. According to the Heritage Foundation’s 2018 Index of Economic Freedom<sup>2</sup>, the Chinese economic index score of 57.8 is labeled as “mostly unfree” due to a tight grip on the financial system and restrictive foreign investment approval system, which also shields inefficient state-owned enterprises from competition from private and foreign companies. In contrast, the Netherlands economic index score of 76.2 is labeled as “free” with its regulatory environment, which supports open-market policies, encouraging private entrepreneurship. Culturally, Chinese are characterized as collectivistic with high power distance and low uncertainty avoidance, while the Dutch are individualistic with low power distance and high uncertainty avoidance ([Hofstede, Hofstede, Minkov, & Vinken, 2013](#)). Similar differences are shown by alternative measures for culture as the GLOBE (e.g. [House et al., 2004](#)) or the Schwartz dimensions (e.g., [Schwartz, 1999](#)). Based on the above, we consider these two countries as being appropriate to study country-specific enablers of IOICT implementation.

The present study seeks to make several contributions. First, this study focusses on antecedents of IOICT implementation from an inter-organizational point of view. Specifically, a multi-theoretical framework combining relational exchange theory and transaction cost theory is used to discuss the relative effects of a contractual posture versus a relational posture on IOICT implementation. The single-dimensional approach, which was dominantly adopted in existing studies on IOICT adoption, is inadequate to describe the complex nature of inter-organizational relationships ([Cannon & Perreault, 1999](#); [Chi et al., 2017](#)). Thus, our multi-theoretical framework hopes to provide a novel perspective on understanding enablers of IOICT implementation for global companies. Second, the study hopes to shed light on the effect of country context on IOICT implementation. Prior empirical studies have tended to focus on single-country analysis or on a cross-country (developing and developed countries) comparison only from an economic perspective ([Bordonaba-Juste et al., 2012](#); [Zhu et al., 2004](#)). This study conceptualizes differences between two countries in terms of disparity in their socio-economic setting. By applying our multi-theoretical framework that specifies the inter-organizational level mechanisms, this study aims to offer fine-grained understanding of the implementation of IOICT across different country contexts. Inspired by the [Cao, Li, Jayaram, Liu and Lumineau \(2018\)](#) study, but in contrast to prior studies, this study aims to provide a better insight into these inter-organizational mechanisms that shape implementation of IOICT across different countries, rather than just acknowledging that countries may differ in socio-economic characteristics. Finally, the findings of this study might be of interest to managers in terms of understanding whether the drivers and mechanisms of IOICT implementation vary from country to country. Specifically, for managers of global companies that aim to implement IOICT with buyers or suppliers, it might be helpful to use an appropriate approach that aligns with the specificities of a country context, rather than pursuing a universal “one size fits all” global approach.

The remainder of this paper is organized as follows. The next section will elaborate on the theoretical background of the paper. Then, we will describe the methodology. The fourth section will present the results and findings. We conclude by discussing our main findings and

<sup>1</sup> <https://data.worldbank.org>

<sup>2</sup> <https://www.heritage.org>: The Index of economic freedom ranks countries as “free,” “mostly free,” “moderately free,” “mostly unfree,” or “repressed” according to the scores.

indicating potential directions for future research.

## 2. Theoretical background and hypotheses development

We first review the relevant empirical studies on the enablers of IOICT. Then, the two underlying theoretical perspectives that drive IOICT implementation are discussed. Finally, in developing our hypotheses, we incorporate the role of country characteristics.

### 2.1. Theoretical perspectives on IOICT implementation

There is a considerable amount of studies on different aspects and types of ICT in the context of inter-organizational relationships and supply chain management (Zhang et al., 2011). The review of Zhang et al. (2011) shows that through improved supply chain integration, directly or indirectly, the performance gains from ICT implementation can be realized. Recent work has further shown the importance of context, e.g. public entities (e.g., Hafizi, 2019; Pilemalm, Lindgren, & Ramsell, 2016) and has shown the different mechanisms suitable for inter-organizational versus intra-organizational ICT (Zhang, Van Donk et al., 2016). While related, these streams of research do not specifically focus on the drivers of and supportive governance mechanisms for IOICT implementation, as this study aims to do.

Based on Hong (2002, p. 261), this paper defines IOICT as technologies and/or practices that transcend organizational boundaries, facilitating information flow from one organization to another. Electronic Data Interchange (EDI) as the first generation IOICT had the limitation of being standardized, platform-specific, expensive, and difficult to implement (Chong & Ooi, 2008). With the development of the Internet, organizations moved towards using e-collaboration or collaborative commerce tools including e-hubs, e-marketplaces, and e-procurement in their supply chains (Ahmad, Abu Bakar, Faziharudean, & Mohamad Zaki, 2015; Chou, Tan, & Yen, 2004). This development is also reflected in prior research (see Table 1).

We review survey-based research on the enablers of IOICT by searching for relevant key words and derivatives such as inter-organizational information technology/system, Internet, and e-adoption. The papers collected through this search process are summarized in Table 1. As Table 1 shows, the majority of studies in this field have surprisingly focused on the firm level, applying theoretical perspectives at the single firm level such as “technology-organization-environment” and “diffusion of innovation”. These theories have been the dominant theories within the literature on adoption of ICT (Mirkovski et al., 2016; Oliveira & Martins, 2010). However, for the adoption of Inter-Organizational ICT, and specifically for web-based technologies, these theories are not adequate in explaining IOICT adoption decisions, as they rely on the ‘single’ organizational perspective (Kurnia, Karnali, & Rahim, 2015). Specifically, such an approach ignores important factors at the inter-organizational level (as column 3 of Table 1 also shows). Researchers have already suggested the need for alternative theories that explicitly consider inter-organizational relationships to understand IOICT implementation (Zhou, Chong, Zhen, & Bao, 2018). From the few studies in Table 1 that take an explicit inter-organizational perspective, it can be concluded that trust and pressure from suppliers and customers are critical factors at the inter-organizational level (Chong & Bai, 2014). Traditionally, trust has been seen as critical for investments in IOICT (such as EDI) because of the difficulty in recouping the high investment costs (Chong et al., 2009). Currently, internet-based IOICT requires lower direct and indirect investments in training of staff or investing in infrastructure. Therefore, trust appears to be less of a prerequisite, as is also supported by Chong et al. (2009) who reported an insignificant relationship between trust and e-business. With regards to pressure from stakeholders, research indicates that pressure from customers and suppliers positively influences the level of IOICT adoption (Ahmad

et al., 2015; Chatzoglou & Chatzoudes, 2016). However, such pressures could stem from a transaction perspective such as safeguarding against opportunism, or from a cooperative norms perspective such as inter-firm integration of business activities, or from both perspectives (Brouthers & Hennart, 2007; Carson et al., 2006; Chi et al., 2017). Specifically, the last joint perspective has recently received more support (Chi et al., 2017). Clearly, more research is needed to explore these issues.

To summarize, current research regarding the enablers of IOICT implementation at the inter-organizational level is limited in that it predominantly takes an intra-organizational theoretical perspective, in contrast to the recommendations made in the Wei, Lowry and Seedorf (2015) study. From those limited studies we learn that apart from important factors such as power and trust, relational and transaction cost theory perspectives would be beneficial. The relevance of these perspectives have been confirmed in recent studies (e.g. Bstieler & Hemmert, 2015; Lee, Kim, & Kim, 2014), but even more in the related field of supply chain integration and buyer-supplier relationship literature (Cao & Lumineau, 2015; Chi et al., 2017). These studies suggest that both contractual and relational governance mechanisms based on the two main theories (transaction cost and relational exchange theory) used in the inter-organizational relationships literature (Cheng, 2011; Clemons & Row, 1991), play a key role in forming inter-organizational relationships. Although both theories have traditionally been seen as competing, it is nowadays increasingly accepted that firms use both contractual and relational governance mechanisms (Cao & Lumineau, 2015; Chi et al., 2017). Consequently, we combine tenets from transaction cost theory, and relational exchange theory to develop a specific theoretical framework that can help explain IOICT implementation. In order not to confuse the reader, we elaborate on these two perspectives separately in the two subsequent subsections.

### 2.2. The contractual posture on IOICT implementation: A transaction cost perspective

The transaction cost perspective has been used to explain drivers of information technology investments (e.g. Martinez & Williams, 2010; Mirkovski, Davison, & Martinsons, 2019). Transaction cost theory argues that asset specificity - firms making tangible investments specific to a buyer-supplier relationship without any residual value - could explain the motivation of firms that make substantial investments in IOICT (Williamson, 1981). Asset specificity could pertain to physical, site or human sources of directed assets (Williamson, 1981). The level of asset specificity varies from non-specific (highly standardized), mixed (incorporating standardized and customized elements in the transaction) to idiosyncratic (highly customized to the organization) (Williamson, 2008). In this paper, we focus on *physical* asset specificity within logistics. We build on and integrate the definitions (and associated items) of packaging integration and delivery integration used in Giménez, Van der Vaart and Van Donk (2012). Specifically, we use customized logistics assets to refer to the use of dedicated packaging materials (e.g. containers), which are adapted to the specific requirements of the customer, and the synchronization of delivery activities (e.g. frequency of delivery). These are more tactical and basic but specific investments in inter-organizational relationships, and usually serve as a preliminary step towards building enhanced relationships. Williamson (2008) indicates that in the case of asset specific investment, safeguards will be needed. Asset specificity is an incentive for relationship continuity because it gives rise to bilateral dependencies, while safeguards are required to mitigate the risk of opportunistic behavior among trading partners. Traditionally, vertical integration was suggested as a safeguard when asset specificity was high (Aubert, Rivard, & Patry, 2004), which can be attained through information sharing as it fosters rich communication, and will motivate partners to

**Table 1**  
Summary of the literature on IOICT adoption.

Theoretical Perspective		Inter-organizational technologies/system	Factors influencing IOICT adoption	Associated Studies
Firm Level	Technology Organization-Environment	EDI	<i>Technological factors:</i> Perceived benefits; Readiness <i>Organizational factors:</i> Financial cost; Technical competence <i>Environmental factors:</i> Industry pressure; External pressure	Iacovou, Benbasat and Dexter (1995), Chwelos, Benbasat and Dexter (2001), Kuan and Chau (2001)
		E-mail/ Internet/web-based	<i>Technological factors:</i> Relative advantage/obstacles; Perceived benefits; Functionalities; Organizational readiness; Network reliability; Data security; Complexity <i>Organizational factors:</i> Top management support; Costs <i>Environmental factors:</i> external pressure; Pressure from partners/competitors	Mehrtens, Cragg and Mills (2001), Hong and Zhu (2006), Sila (2010)
		E-business/E-commerce	<i>Technological factors:</i> Perceived ease of use/benefits; Organizational/Consumer Technology / trading partner readiness; Technology competence; Technology integration; IS infrastructure; IS expertise; Compatibility; Complexity. <i>Organizational factors:</i> Organisational learning ability; Information intensity; CEO's IS knowledge; Manager support/attitude; Compatibility Managerial obstacles; technology vendors' support; Firm size; E-commerce knowledge <i>Environmental factors:</i> Government support; Customer orientation/power/readiness, Competitor Orientation; Normative pressure; External/Business partners pressure; Regulatory environment; Competitive pressure; Market trends expectations; Adhocracy culture	Alsaad, Mohamad and Ismail (2019), Mirchandani and Motwani (2001), Grandon and Pearson (2004), Xu, Zhu and Gibbs (2004), Hong and Zhu (2006), Lin and Lin (2008), Oliveira and Martins (2010), Ghobakhloo, Arias-Aranda and Benitez-Amado (2011), Bordonaba-Juste et al. (2012), Theodosiou and Katsikea (2012), Ahmad et al. (2015), Chatzoglou and Chatzourides (2016), Alsaad, Mohamad and Ismail (2017), Hamad, Elbeltagi and El-Gohary (2018), Lim and Trakulmaykee (2018), Ocloo et al. (2018)
Inter-organizational Level	Diffusion of Innovation Theory of planned behavior — Inter-organizational relationship	Internet-based	Relative advantage; Complexity, Compatibility, Security; Competitive pressure; Information sharing; Environmental uncertainty	Chong and Bai (2014)
		E-invoice	Firm's environment; Compatibility with culture; Perceived ease of use; Perceived usefulness; Perceived security; Satisfaction	Hernandez-Ortega et al. (2014)
		E-business	Learning capabilities; Knowledge management; Adhocracy culture	Migdadi, Zaid, Al-Hujran and Aloudat (2016)
		E-business/E-commerce	Trust, Communication; Collaboration; Perceived transparency; Trading partners' power; Information sharing; Partner usage; Resource dependency	Alsaad et al. (2017) (2019), Chong et al. (2009), Hong and Zhu (2006)
		Open IOS (RosetaNet)	Trust; Communication; Collaboration; Perceived transparency; Trading partners' power	Chong and Bai (2014)
		Web-based EDI/ IOISs	Supplier synergy; Inter-operable IT infrastructure; Collaborative structure; inter-organizational power dependence; cooperativeness	Ranganathan, Teo and Dhaliwal (2011), Tan and Ludwig (2016), Wu and Chuang (2010)



act in congruence – as though they were extensions of the same firm. Information sharing is defined as the scope and intensity of exchanging both strategic (forecasts) and transactional (planning) information in a buyer-supplier relationship (Han, Huo, & Zhao, 2019). Therefore, this paper considers information sharing as a safeguard towards logistics asset specificity for the key buyer. Together, asset specificity and safeguards make up for what we label in our framework as the contractual posture. In the context of the above discussion: a contractual posture is defined as an inter-organizational relationship having both agreed upon asset specificity (i.e., customized logistics assets) as well as safeguards (i.e., information sharing).

IOICT implementation itself can also be regarded as a kind of asset specific investment as it refers to investments made to unify a firm's technology with its partners' technology (Kim et al., 2011). Further, IOICT serves as a platform from which adjustments can be made to align with partner's business processes and systems. IOICT implementation facilitates information exchange in a timely manner, which helps to reduce transaction risks (Chi et al., 2017; Vanpoucke, Vereecke, & Muyllé, 2017). Examples of these risks include inventory holding risks, freight coordination risks and administrative risks resulting in lower costs (Peng, Quan, Zhang, & Dubinsky, 2016). Thus, IOICT implementation can be regarded as both asset specific and as a safeguard, which further consolidates and deepens our conceptual underpinning of the contractual posture. From a cost and time perspective, bilateral investments in a contractual posture tend to be long-term in nature, and are therefore, irreversible, at least in the short-term. Partners that have a contractual posture aim for continuity and for mutual gains by further decreasing transaction costs. Generally, IOICT can reduce coordination costs and risks as it helps to manage boundary spanning activities between connected partners digitally (García-Alcaraz, Maldonado-Macías, Alor-Hernández, & Sánchez-Ramírez, 2017). Technologies such as RFID, EDI and electronic transmission of purchase orders result in streamlining and automating business processes between supply chain partners which can subsequently lead to reduced transaction costs (Tsang et al., 2018; Oghazi et al., 2018). Thus, IOICT implementation can help firms reduce transaction costs.

### 2.3. The relational posture on IOICT implementation: A relational exchange perspective

The relational exchange theory states that relational norms such as flexibility and solidarity remind cooperative parties that their relationship is holistic, and that they are expected to behave according to shared relational norms (Cao & Lumineau, 2015; Ellegaard & Medlin, 2018). Earlier research starting from the seminal paper by Heide and John (1992) indicated that an ongoing process of establishing and applying relational norms between trading partners as characterized by continuous interactions and adaptations can lead to positive SC performance results. As manufacturing firms focus increasingly on their core competency, they rely more on strategic suppliers (Dong, Ma, & Zhou, 2017). Strategic partners therefore aim for long-term relationships rather than short-term contracts (Yadavalli, Darbari, Bhayana, Jha, & Agarwal, 2019). As relationships with suppliers are considered to be of strategic importance, suppliers are seen to be an integral part of the firm's operations (La Rocca et al., 2019). Such a view comes with cooperative behaviors - attitudes and practices facilitated by trust - that are characterized by shared responsibility and flexibility in arrangements. Such flexibility can help deal with unexpected situations, and work out solutions for problems jointly (Johnston, McCutcheon, Stuart, & Kerwood, 2004). Such activities and behavior can be associated with what we label as a relational posture, which is defined as a posture that considers a buyer-supplier relationship as being governed by relational norms and attitudes (Giménez et al., 2012). A relational posture will encourage additional investments such as IOICT in order to extend and tighten the buyer-supplier linkages (Patnayakuni, Rai, & Seth, 2006). Lee et al. (2014) found that a relational posture can be associated with

the existence of an information technology connection between partners. Similarly, Wiengarten, Humphreys, McKittrick and Fynes (2013) and Chong and Bai (2014) both have reported that more collaborative organizations are likely to adopt e-business to further improve collaboration amongst trading partners.

### 2.4. Development of hypotheses

Based on the above theoretical explanations, we develop our main hypotheses that relate country context to both the relational and the contractual posture in implementing IOICT.

#### 2.4.1. Country context as a determining factor

As indicated in the introduction, this study examines the IOICT implementation from an inter-organizational relationship perspective. From international business studies it is well known that country differences, captured in national culture, economic development, economic freedom and the nature of the legal system, influence inter-organizational norms (e.g. Cao et al., 2018; Liu & Almor, 2016). These studies point towards considering the moderating role of country context on inter-organizational relationships. For reasons of clarity, we have provided support for these two postures separately. Similar to the Chi et al. (2017) study, we suggest that rather than relying on one single posture, both postures might be simultaneously applicable. However, given the specific country context, their relative influence might differ. This is in line with Carson et al. (2006) and Cao et al. (2018) who suggest that differences in uncertainty and national culture make the relational or contractual posture more effective. Consequently, we argue for relational posture being the driving force in China and for the transactional posture in the Netherlands.

According to the International Monetary Fund's World Economic (2018), China is a developing country, markets and economic activities are directly influenced by formal and informal policies of central or local governments (Cai, Jun, & Yang, 2010). Furthermore, the underlying structure of China's economy accentuates the merits of bank-based or relationship-based finance as the impetus for economic growth in an underdeveloped financial sector with low contractibility (Yap & Sufian, 2018). Thus, Chinese firms prefer a more flexible way, based on negotiation and compromise, rather than going through legal means that tend to be based on a strict and literal application of contracts, to resolve disputes (Xue, Yuan, & Shi, 2016). In terms of culture, collectivism, power distance, and uncertainty avoidance are widely recognized as key dimensions related to inter-organizational governance (Cao & Lumineau, 2015; Handley & Angst, 2015). High collectivism and a high power distance have been proven to be closely related to what is labelled as "guanxi" (Dunning & Kim, 2007) which is an important cultural feature to understand the Chinese context (Cai et al., 2010; Huang, Davison, & Gu, 2011). The term guanxi refers to networks of informal, personal relationships that dominate business activities that include exchanges of favors (Dong et al., 2017; Lee, Ooi, Chong, & Sohal, 2018). These informal relationships constitute social capital at the organizational level (Dymitrowski, Fonfara, & Deszczyński, 2019; Geng, Mansouri, Aktas, & Yen, 2017). Through informal relationships, firms can obtain information regarding manufacturing technologies, new technical advances and new product features from managers of other firms (Lee et al., 2018). This forms the crucial institutional context to understand Chinese firms' understanding of their external environment that could influence interfirm behaviors (Cai et al., 2010). The cultural dimensions as embedded in guanxi (in China) imply a more cooperative, relational and network based inter-organizational landscape. In China uncertainty avoidance is low, and formal rules and structures tend to be less welcomed whereas flexibility is more valued (Cao et al., 2018). The legal system in China is less transparent and consistent (Hsu, Arner, Wan, & Wang, 2005), with evidence suggesting that police and judicial activities are embedded in guanxi networks (Wang, 2014). Therefore, we submit that in the Chinese context,

managers will rely more on relational norms and cooperation as implied in a relational posture as our hypothesis proposes:

**H1.** In the Chinese context, the relational posture will contribute to IOICT implementation more than the contractual posture.

The Netherlands, in contrast, as a Western, and more developed country has a mature, and developed market, with full and open competition (Reinartz, Dellaert, Krafft, Kumar, & Varadarajan, 2011). With regard to culture, the Netherlands is characterized by individualism, low power distance and high uncertainty avoidance. In the Netherlands (as in more Western countries), the fundamental reason for low power distance is that people are governed by multiple institutions such as laws and procedures rather than hierarchy (Jia & Rutherford, 2010). The strong legal systems decrease transaction uncertainty, reduce cost of reputation building, and increase trust in contracts with trading partners (Oxley & Yeung, 2001). Organizations are accustomed to turn to legal systems to resolve disputes. Furthermore, compared to collectivistic societies that emphasize partner commonality to ensure cooperative success, individualistic societies tend to emphasize contractual safeguards (Mattsson, 2003). Moreover, firms in high uncertainty avoidance cultures try to avoid risks, and are more likely to make use of contractual governance as a legitimate way to address exchange hazards (Handley & Angst, 2015). Thus, firms in high uncertainty avoidance cultures are likely to use more contractual governance as compared to firms in low uncertainty avoidance cultures (Cao et al., 2018). Based upon the above mentioned arguments for the more formalized, more developed legal institutional context along with almost opposite values on cultural dimensions in the Netherlands as compared to China, short-term planning horizons, risk-taking and economic issues dominate. Collectively these typify the contractual posture rather than the relational posture (Geng et al., 2017; Handley & Angst, 2015). Therefore, in the Dutch context, the contractual posture will be a better fit to understand enablers for IOICT implementation as compared to the relational posture. Additionally, given the legal structure, conflicts can be resolved without tight relational ties (Cannon, Doney, Mullen, & Petersen, 2010). Thus, the second hypothesis is formulated as:

**H2.** In the Dutch context, the contractual posture will contribute to IOICT implementation more than the relational posture.

#### 2.4.2. IOICT implementation and supply chain performance

There has been an abundance of research relating IOICT to supply chain performance. IOICT implementation represents the process of assuring that the inter-organizational information technology is operational, and allows the partners to take over its operations for use and evaluation (e.g. electronic transfer, coordination based on electronic links) (Kendall and Kendall, 2010). Both a comprehensive review of Daneshvar Kakhki and Gargeya (2019) and research done since the study of Chang, Wong and Chiu (2019) indicate that the implementation of IOICT mainly improves two major dimensions of supply chain performance: i.e., cost and service relative to delivery (speed, dependability, and flexibility). In line with past work, we also focus on the two dimensions of cost and service. Cost is defined as a firm's ability to minimize the costs associated with managing its supply chain operations including production, administration and cost of serving customers (Um, Lyons, Lam, Cheng, & Dominguez-Pery, 2017). Service refers to the level of buyer's satisfaction with order quantities, compliance with special requirements, delivery lead times and advance notifications about late deliveries and stock-outs from the buyer (Giménez et al., 2012). Whether it is cost or service, the majority of empirical studies supports a positive relationship between IOICT and performance (e.g. Lee et al., 2014; Shi & Liao, 2015; Zhang, Xue et al., 2016).

IOICT enables effective and efficient information across organizational boundaries, which, in fact, establish communication standards to ease information flows between trading partners (Liu, Prajogo, & Oke,

2016). Better communication provides an effective platform enabling the focal firm to better predict demand and coordinate real time with supply chain partners (Tarafdar & Qrunfleh, 2017; Zhang & Cao, 2018), along with reduced costs of serving and managing partners (Yu, Yan, & Edwin Cheng, 2001). Furthermore, production cost savings and reduction in inventory holding quantities can be realized due to improved communication accuracy and reliability, while savings in purchasing and transportation costs can also be enjoyed due to IOICT, for example, through collaborative planning with suppliers (Wong, Lai, & Bernroider, 2015; Zhang, Van Donk et al., 2016). Thus, we propose that:

**H3a.** IOICT implementation has a positive relationship with supply chain cost performance.

Through frequent sharing of information such as point of sales data and real-time inventory data, supply chain partners can more accurately predict or forecast demand, which subsequently improves service levels and delivery performance (Liu et al., 2016). IOICT implementation facilitates communication between partners, thereby reducing information processing lead time and reducing total lead time in a supply chain (Liang and Huang, 2006). The increased visibility of decision-making processes due to IOICT helps firms prepare for risk events and better allocate their resources to complex, and unexpected situations such as late deliveries (Fan, Li, Sun, & Cheng, 2017). Therefore, we argue that:

**H3b.** IOICT implementation has a positive relationship with supply chain service performance.

All the relationships discussed above are summarized as our conceptual model which is shown in Fig. 1 (see the Results section).

### 3. Methodology

This section discusses the phases of questionnaire development, data gathering, and data analysis.

#### 3.1. Questionnaire development

All items of the survey were derived from prior research (Bstieler & Hemmert, 2015; De Toni & Nassimbeni, 2000; Frohlich & Westbrook, 2002; Giménez et al., 2012; Johnston et al., 2004) but adapted to make them more suitable for our target population. As our target population was suppliers, and their relationships with the key buyer (further defined as the most important buyer), we focused on the links to the key buyer, and the performance of supplier as it related to the key buyer's requirements. The definitions of the constructs have already been provided in the theoretical section. Here, we elaborate upon the measurement aspects. As indicated earlier, contractual posture was measured to include information sharing and customized logistics assets. Information sharing was measured using items from De Toni and Nassimbeni (2000), Frohlich and Westbrook (2002), thereby stressing elements that pertained to the extent to which the buyer communicated sales forecasts and planning information to the supplier. The operationalization of the customized logistics assets construct was consistent with the approach followed in De Toni and Nassimbeni (2000) and in Frohlich and Westbrook (2002), by focusing on specific packaging agreements, and delivery frequency. Earlier research used a similar operationalization but labelled it as two constructs: packaging integration and delivery integration (Giménez et al., 2012). Relational posture was measured by items adapted from Johnston et al. (2004) and Bstieler and Hemmert (2015) by focusing on joint problem solving and cooperation in solving issues. Performance was measured following the approach reported in Giménez et al. (2012) wherein cost performance included production, administration and cost of serving customers among others, while service performance included buyer's satisfaction with order quantities, compliance with special requirements, delivery

lead times and advance notifications about late deliveries and stock-outs. All items were measured using a 5-point Likert scale. While all measures were subjective, which could be considered as a weakness for performance related measures, our study used scales and approaches similar to most prior studies in supply chain management and ICT research (e.g. Van der Vaart & van Donk, 2008; Zhang et al., 2011). Subjective performance measures have been argued to be a viable option in survey research (Ketokivi & Schroeder, 2004).

First, the English questionnaire for use in The Netherlands context was developed. This was then translated into Chinese and back-translated into English separately by three different academics from the operations management discipline. Subsequently, the English questionnaire was checked by an expert in the operations management field to confirm the consistency between the English and Chinese version. Finally, the questionnaire was evaluated through a pilot test. That pilot test involved five academics in the operations management and information management fields, four operation managers and two CEOs (Chief Executive Officer) from different manufacturing firms. They were asked to assess the questions to improve the clarity of the questionnaire and the way in which questions were asked, resulting in minor changes in wording, before final adoption.

### 3.2. Sample and data gathering

In China, a convenience type of sampling was used to ensure access and high response rate of relevant companies. For that reason, the database from two institutions - the China IT promotion institution, and the Zhejiang Province Enterprise Association - were chosen. The China IT promotion institution had an objective to promote ICT application in industry, and its membership included nationwide manufacturing firms in China. Zhejiang Province Enterprise Association covered one of the largest industrial areas in China. As this study aimed at tapping into industrial suppliers, we checked whether the contacted companies were indeed suppliers. This process resulted in obtaining a list of 278 companies from the first institution, and 386 companies from the second.

To ensure data quality, we targeted ICT managers and/or top executives as respondents, e.g. Managing Directors and CEOs, as most likely being involved in making the decision to adopt ICT. Our target respondents are in line with other studies on adoption of ICT (López-Nicolás & Soto-Acosta, 2010; Lucia-Palacios, Bordonaba-Juste, Polo-Redondo, & Grünhagen, 2014). Either these executives completed the questionnaire themselves, or they forwarded it to appropriate knowledgeable “key informants” (Phillips, 1981). One of the authors led research assistants to distribute the hardcopy version of our survey at the annual conference of the China IT promotion institution. Most participants in the conference are ICT managers or top executives who met the criteria for our target respondents. Before distributing the questionnaire, we checked whether the person attending the conference was the appropriate respondent. If not, the questionnaire was then mailed to the person that they recommended. For the Zhejiang Province Enterprise Association, the printed version was mailed directly to the target companies. The above two steps were executed at the same time. Non-respondents were sent a reminder together with a link to the electronic version of the survey. During the conference, we distributed 152 questionnaires and got 124 responses (response rate of 81.6 percent). Additionally, 43 companies responded to the survey posted online to the 126 remaining target companies (response rate of 34.1 percent). The response from the Zhejiang Province Enterprise Association was 44.5 percent (172 returns from the 386 sent). Our final sample contained 320 usable respondents, after taking into account surveys that were not completed fully. Therefore, the overall response rate in China was 48.2 percent (320 out of 664). Our respondents were mainly supply chain managers (30 percent), directors (21 percent), and (vice-) presidents (17 percent), all of whom reflected high ranked representatives that had responded to our survey, indicating good reliability for the responses to our survey (Phillips, 1981). The data were

examined for non-response bias by exploring differences between early and late respondents (Armstrong & Overton, 1977). We also checked for possible differences between the two samples, but concluded there were no significant differences (at  $p < 0.05$ ).

For the data collection in the Netherlands, we selected from the mailing list of the Dutch Chambers of Commerce, companies in SIC 33–38 that represented all manufacturing firms in sectors such as metal parts, transportation, electronic and industrial equipment and parts, and other manufacturing industries. This yielded a target population of 1,016 companies. With the help of research assistants, the websites of these companies were screened to ensure the suitability of the company (being a manufacturer) to our survey, an initial contact was made by telephone to ask for cooperation and to identify a key person (e.g. being a logistics, ICT, sales or general manager) that could fill out the questionnaire. Questionnaires were provided either via a website link or by email, and follow-up emails were sent in order to encourage participation. Finally, the authors checked all returned questionnaires for completeness and appropriateness, resulting in a useable response of 122 companies. The overall response rate of 12 % is comparable to response rates for surveys in other developed countries in Europe and USA. There was no significant difference (at  $p < 0.05$ ) between early and late respondents and therefore it was concluded that non-response bias did not pose to be a serious issue in the Dutch sample. We acknowledge that there was a difference in sample sizes between the two countries (partly reflecting difference in size between the two countries), but, following normal procedures, our analysis took into account these different sample sizes. Finally, because of the non-response and the sampling procedure (specifically in China), we do not claim to have a representative sample, but given that our aim was to compare countries, this does not provide a serious limitation for this study.

### 3.3. Factor analysis

Covariance-based structural equation modeling (CB-SEM) is primarily used for confirmation of established theory (i.e., explanation) and for larger sample sizes ( $N \geq 100$ ). In contrast, variance-based partial least squares (PLS-SEM) is a prediction-oriented approach primarily used for exploratory research more suitable for smaller sample sizes ( $N \leq 100$ ) (Hair, Matthews, Matthews, & Sarstedt, 2017; Sarstedt, Ringle, Henseler, & Hair, 2014). Based on our theory-testing objective and sample sizes we chose the CB-SEM approach using AMOS 22.0 as a tool, to test our hypotheses. Model-fit assessment was conducted through Chi-square, GFI (Goodness of Fit Index), CFI (Comparative Fit Index); RMSEA (Root Mean Square Error of Approximation), and IFI (Incremental Fit Index). GFI, CFI, IFI values of 0.90 and above, and RMSEA values of .06 or below indicate acceptable model fit (Hu & Bentler, 1999).

#### 3.3.1. Common method variance

Given our research design, common method variance (CMV) might inflate our results (Podsakoff & Organ, 1986). Firstly, we followed the approach recommended in Podsakoff and Organ (1986) to examine the possibility of CMV. By comparing a one-factor model with the six-factor model, the latter model ( $\chi^2/df = 2.57$ , GFI = 0.88; CFI = 0.91; RMSEA = 0.06, IFI = 0.92) showed a much better model fit than the former model ( $\chi^2/df = 7.87$ , GFI = 0.64; CFI = 0.61; RMSEA = 0.12, IFI = 0.61), which indicates that the respondents could distinguish the measurement constructs in a good way, and that CMV is most likely not a concern.

Additionally, based on the comprehensive discussion reported in Williams, Hartman and Cavazotte (2010), we further checked for CMV using the widely adopted correlational marker technique (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Siemen, Roth, & Oliveira, 2010). A suitable marker variable is one that is theoretically unrelated to the variables of interest. Therefore, we selected “Demand Uncertainty” as the marker variable, which has no correlation with other variables (see Table 2).



**Table 2**  
Correlation analysis between marker variable and other variables.

Path	Estimate	S.E.	P-value
DU WITH IOICT	0.077	0.047	0.104
DU WITH CLOAS	−0.042	0.045	0.350
DU WITH INFSH	−0.046	0.051	0.367
DU WITH RELPO	−0.039	0.040	0.337
DU WITH COSTP	0.016	0.027	0.547
DU WITH SERVP	−0.032	0.020	0.106

Legend: DU = Demand Uncertainty; CLOAS = Customized logistics assets; INFSH = Information sharing RELPO = Relational Posture; COSTP = Cost performance; SERVP = Service Performance.

**Table 3**  
Marker variable analyses.

Model	Chi-Square	Df	CFI
1. CFA Model	868.04	303	0.88
2. Base Model	879.99	312	0.88
3. Method-C Model	879.60	311	0.88
4. Method-U Model	848.33	289	0.88
5. Method-R Model	—	—	—
△ Models	△Chi-Square	△df	P Value
Base Model vs. Method-C Model	0.386	1	0.54
Method-C Model vs. Method-U Model	31.272	22	0.09

Next, we conducted marker variable analyses following the recommended best practices (Williams et al. (2010)). The results are shown in Table 3. We found that method-C model does not fit significantly better than the baseline model, thereby indicating that the likelihood of CMV in the data was low. Method-U model also does not fit significantly better than method-C model, which points to no evidence for unequal method effects. The marker variable analyses further confirm that CMV was not an issue for this study.

### 3.3.2. Reliability and validity

Confirmatory factor analyses (CFA) was performed to check whether the items met the criteria for convergent and discriminant validity, as well as for construct reliability. The results of the factor analysis are presented in Table 4. All Cronbach's alphas were equal to or exceeded the widely accepted cut off value of .70 (Nunnally & Bernstein, 1994). All items loaded significantly on their corresponding latent construct at the .001 level, indicating that the constructs were appropriately reflected by their indicators. Further, the average variance extracted (AVE) values ranged from 0.50 to 0.61, which is above the 0.50 threshold (Bagozzi & Yi, 1988). In order to assess the unidimensionality of each construct, we calculated composite reliabilities (CR). All CRs ranged from 0.79 to 0.88, which exceeded the generally acceptable level of 0.70 (Nunnally & Bernstein, 1994).

Although the above results are generally perceived as being acceptable, we followed Dunn, Baguley and Brunsden (2013) to consider additional reliability coefficients along with Cronbach's alpha. The associated tests were performed by using the naming convention, methods and practical tools (specifically the "Relcalc" tool<sup>3</sup>) provided in Cho (2016) for obtaining multidimensional reliability coefficients. The results in Tables 5 and 6 show that all reliability coefficients are above the recommended threshold value of 0.6 (Zikmund, Babin, Carr, & Griffin, 2010).

Having satisfied all these tests, we felt confident that the measurement model demonstrated reliability, discriminant validity and convergent validity. In line with previous studies, multi-group analysis was adopted for testing measurement equivalence (Cheung & Rensvold,

**Table 4**  
CFA results for measurements scales and associated indicators.

Items	Factor Loading
<b>Relational Posture: <math>\alpha = .86</math>, CR = .86, AVE = .61</b>	
(Please indicate the degree to which you agree with each statement) <sup>b</sup>	
In most aspects of this relationship, the parties are jointly responsible for making sure that tasks are completed	0.86
Problems that arise in the course of this relationship are treated as joint rather than individual responsibilities	0.85
When some unexpected situation arises, the parties would rather work out a new deal than to hold each other to the original terms.	0.80
It is expected that the parties will be open to modifying their agreement if unexpected events occur	0.83
<b>IOICT implementation: <math>\alpha = .84</math>, CR = .85, AVE = .53</b>	
(Please indicate the degree to which you agree with each statement) <sup>b</sup>	
We use information technology-enabled transaction processing with our key buyer. (e.g. EOS, POS)	0.74
Inter-organizational coordination between our key buyer and our firm is achieved using electronic links	0.84
We use electronic transfer of purchase orders, invoices and/or funds with our key buyer (e.g. EDI, RFDC- Radio Frequency Data Communications /Collection)	0.62
We use advanced information systems to track and/or expedite shipments to our key buyer.	0.83
We have online access to the planning system of our key buyer.	0.61
<b>Customized logistics assets: <math>\alpha = .79</math>, CR = .80, AVE = .50</b>	
(Please indicate the degree to which you agree with each statement) <sup>b</sup>	
Containers and packaging instruments of outgoing materials are adapted to the precise requirements of the key buyer	0.70
We use packaging materials (pallets, containers, etc.) suited to the internal handling system of the key buyer	0.93
We deliver to our key buyer frequently	0.56
<b>Information sharing: <math>\alpha = .88</math>, CR = .88, AVE = .65</b>	
(Please indicate the degree to which you agree with each statement) <sup>b</sup>	
Receive information about the production plans of our key buyer.	0.80
Receive information about changes in the production plans of our key buyer at once.	0.87
Receive information about the sales forecasts from our key buyer	0.76
Receive information about stock levels from our key buyer	0.84
<b>Cost performance: <math>\alpha = .66</math>, CR = .81, AVE = .59</b>	
(Please indicate the degree to which you agree with each statement) <sup>b</sup>	
The cost-to-serve the key buyer	0.75
The production costs related to the key buyer	0.79
The administrative costs related to the key buyer	0.76
<b>Supplier service performance: <math>\alpha = .65</math>, CR = .79, AVE = .50</b>	
(Provide an indication of the improvement of your organization's performance relative to three years ago. In case the relationship with your key buyer is shorter than three years, please refer to the improvement of your performance since the start of the relationship) <sup>c</sup>	
Provides the quantities ordered by the key buyer	0.74
Has a short delivery lead time	0.66
Responds to the special requirements of the key buyer	0.69
Notifies the key buyer in advance about late deliveries or stock-outs	0.71

<sup>a</sup>Scale: No use - significant use (1-5).

<sup>b</sup>Scale: Totally disagreed - totally agreed (1-5).

<sup>c</sup>Scale: Far worse - Far better (1-5).

<sup>3</sup> "Relcalc" tool see <http://relcalc.blogspot.com/2016/05/how-to-obtain-and-use-relcalc.html>

**Table 5**  
Reliability coefficients (unidimensional parallel model).

Reliability of the model	Relational Posture	IOICT Implementation	Cost Performance	Service Performance
The estimate of parallel reliability (i.e., standardized alpha) is	0.86	0.84	0.66	0.65
The estimate of tau-equivalent reliability (i.e., coefficient alpha) is	0.86	0.84	0.66	0.65
The estimate of congeneric reliability (i.e., composite reliability) is	0.86	0.85	0.70	0.65

**Table 6**  
Reliability coefficients (Multidimensional parallel model: Contractual posture).

		Reliability	% second-order factor	% disturbance
Reliability of the model		0.92	0.77	0.15
Reliability of sub-test constructs	First-o factor 1	0.86	0.35	0.51
	First-o factor 2	0.89	0.83	0.06

2002; Cole, Bedeian, & Feild, 2006). The model was constrained by setting the factor loadings to be equal for both models. The results support rejecting the null hypothesis of invariant factor loadings between the Chinese and Dutch data.

#### 4. Results

In order to test our hypotheses of the country effect, and the differences between the two countries, we estimated a full model for both countries, and subsequently compared the path coefficients. The results for each of the two countries separately are summarized in Table 7 and in Fig. 1 below. All models had a reasonable fit to the data in terms of statistics, despite a relatively small sample size for The Netherlands. The results indicated that in China, both contractual posture and relational posture had a significant relationship with IOICT implementation. However, the effect of contractual posture ( $\beta = 0.68$ ,  $p < 0.001$ ) on IOICT implementation was higher than the effect of relational posture ( $\beta = 0.14$ ,  $p < 0.001$ ).

In the Netherlands, the contractual posture seemed to be an antecedent to IOICT implementation, while the relational posture was not. For both countries, IOICT implementation improved service performance, while there was no significant relationship between IOICT implementation and cost performance. In order to assess the moderating influence of the country context we conducted a multi-group analysis, following the approach by Wang, Zhang and Zhang (2019). Based on the separate country structural equation models (SEMs), a chi-square difference test assessed the metric invariance, by comparing intercepts of the measurement model. Table 7 (last column) shows that the relational posture has a significantly higher effect on IOICT implementation in China than in the Netherlands, providing evidence for the moderating role of country context. Taken together, the above results did not

fully support our hypothesis (H1) for the Chinese context, while the results supported the hypothesis (H2) for the Dutch context.

##### 4.1. Post-hoc analysis: integrating the contractual and relational posture

The results show that the contractual posture had an important influence on IOICT implementation in both countries, with a somewhat unexpected high effect in China. At the same time, the relationship between relational posture and IOICT implementation was only significant in the Chinese subsample, but not in the Dutch subsample. These somewhat unexpected results inspired us to do some further analysis to better understand the effects of contractual and relational governance. This post-hoc analysis was also inspired by recent studies that suggest an interaction between both types of governance (Cao and Lumineau, 2015; Chi et al., 2017; Huber, Fischer, Dibbern, & Hirschheim, 2013). Consequently, we extended our model by adding a link between contractual and relational posture. This is labelled as the integrated model. The results are shown in Table 8.

The results for the integrated model in the Chinese subsample indicated that by adding a link between contractual and relational posture, the effect of the relational posture on IOICT implementation becomes insignificant. In addition, the integrated Chinese model showed a direct significant relationship between the relational posture and the contractual posture ( $\beta = 0.59$ ,  $p < 0.001$ ), while this relationship was not significant in the Netherlands sub sample. For the Chinese context, the change in the  $\beta$ -coefficient for the relationship between relational posture and IOICT implementation changed from being significant ( $\beta = 0.14$ ,  $p < 0.001$ ) in the original conceptual model, into being insignificant ( $\beta = 0.10$ , ns) in the post-hoc, integrated model. This meant that the contractual posture fully mediated the effect of the relational posture on IOICT implementation. In other words, the relational

**Table 7**  
Result of structural equation modeling of the conceptual model for both countries.

Paths in structural model	China		The Netherlands		Multi-county comparison	
	Estimate	P-value	Estimate	P-value	$\Delta$ Chi-Square	P-value
Contractual posture $\rightarrow$ IOICT implementation	0.68	<0.001	0.51	0.002	0.15	0.70
Relational posture $\rightarrow$ IOICT implementation	0.14	<0.001	0.03	0.89	7.91	0.005
IOICT implementation $\rightarrow$ Cost performance	0.005	0.95	0.15	0.16	3.49	0.06
IOICT implementation $\rightarrow$ Service performance	0.40	<0.001	0.45	0.03	0.07	0.79
Information sharing $\rightarrow$ Contractual posture	0.96	<0.001	0.70	<0.001	—	—
Customized Logistics Assets $\rightarrow$ Contractual posture	0.66	<0.001	0.75	<0.001	—	—
Model fit statistics						
$\chi^2/df$	2.22		1.40		—	
GFI	0.88		0.82			
IFI	0.93		0.91			
CFI	0.92		0.90			
RMSEA	0.06		0.06			

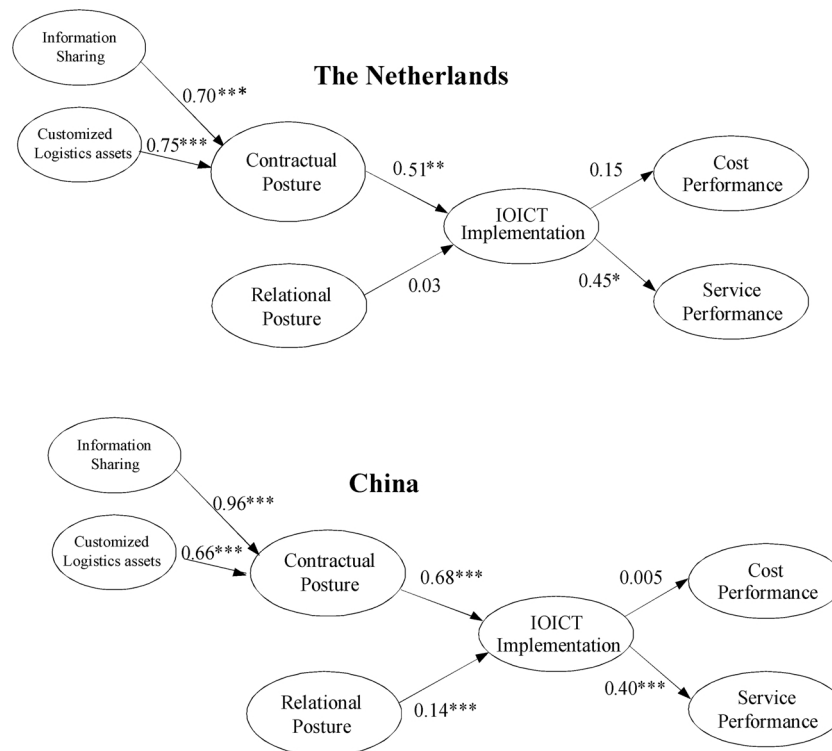


Fig. 1. Results of Chinese and Dutch data.

Table 8

Post-hoc analysis: Result of structural equation modeling of integrated models for both countries.

Paths in structural model	China		The Netherlands	
	Estimate	P value	Estimate	P value
Contractual Posture → IOICT implementation	0.63	<0.001	0.53	0.002
Relational Posture → IOICT implementation	0.10	0.19	−0.05	0.67
Contractual Posture → Relational Posture	0.59	<0.001	0.35	0.07
IOICT implementation → Cost performance	0.005	0.93	0.15	0.16
IOICT implementation → Service performance	0.40	<0.001	0.45	0.03
Information sharing → Contractual Posture	0.96	<0.001	0.71	<0.001
Customized Logistics Assets → Contractual Posture	0.66	<0.001	0.75	<0.001
Model fit statistics				
$\chi^2/df$	2.66		1.37	
GFI	0.87		0.82	
IFI	0.90		0.91	
CFI	0.90		0.91	
RMSEA	0.07		0.06	

posture leads to a contractual posture, which in turn, improves the level of IOICT implementation.

## 5. Discussion

The objective of this study was to isolate and investigate specific mechanisms that explain IOICT implementation across different country contexts. In the section, we provide a synthesis of our results in relation to existing, published work on this topic. We follow the logic from our hypotheses development, after a general reflection on our research model.

### 5.1. The relative impact of contractual and relational postures on IOICT

A contractual posture is governed by a formal mechanism, or written contract, while the relational posture relies more on informal structures, and self-enforcement across parties (Chi et al., 2017; Huber

et al., 2013). Firms usually pursue information system integration with their partners through a written, and more formalized contract. Therefore, IOICT implementation can also be regarded as an example of a formal way of inter-organizational communication. Transaction cost theory argues that well-established contractual governance could be an effective mechanism to control exchange hazards such as opportunism (Alagheband, Rivard, Wu, & Goyette, 2011; Williamson, 1981). Firms which already have built an initial contractual posture will naturally select IOICT to consolidate and develop that contractual relationship (Gong, Kung, & Zeng, 2018). In contrast, partners who have a relational posture are used to and rely more on communicating in an informal, and relatively unstructured way via face-to-face meetings, phone calls or by E-mail. They may feel less need to further implement IOICT since things are already going well (Chong & Bai, 2014).

Considering these disparate mechanisms explicitly is an important contribution of our study. This is so because the extant literature regards inter-organizational relationship as an integrated concept, but

does not explicitly consider the preceding mechanisms of relationship building and development as a potential enabler. Our findings help to interpret mixed results reported in the literature with respect to the link between inter-organizational relationship and IOICT implementation. Some studies have shown that information sharing had a positive impact on IOICT implementation (Chong et al., 2009; Shen, Hawley, & Dickerson, 2004). While, Lee et al. (2014) found a high correlation between partner's asset specificity and IOICT implementation, the relationship between trust or communication and IOICT adoption has been reported as being insignificant (Chong & Bai, 2014; Chong et al., 2009). These findings in earlier research, to a certain extent, corroborate well with our results, as they also suggest the importance of the contractual posture in IOICT implementation, while challenging the widely-acclaimed idea that the relational posture is the main or only factor leading to successful IOICT implementation.

## 5.2. IOICT adoption in China

The results of testing our conceptual model show that in China, the contractual posture ( $\beta = 0.68$ ,  $p < 0.001$ ) contributes to successful IOICT implementation more than the relational posture ( $\beta = 0.14$ ,  $p < 0.001$ ). Furthermore, the extended, integrated model as tested in the post-hoc analysis shows that the impact of the relational posture is actually mediated via the contractual posture. H3a which proposed that IOICT implementation has a positive relationship with supply chain cost performance was not supported. There are several possible explanations for this. Firstly, relational posture in China is more based on personal-oriented relationships because of the culture of *guanxi* (Xue et al., 2016), which emphasizes informal exchange of resources and information (Lovett, Simmons, & Kali, 1999). IOICT implementation for process integration involves formal, joint actions between parties, and thus demands formal routines for coordination. Successful IOICT implementation depends on systematic arrangements between partners to provide resources, and facilitate data transfer (Pérez-López, Olguín-Tiznado, García-Alcaraz, Camargo-Wilson, & López-Barreras, 2018; Van der Aalst & Kumar, 2003) rather than on informal, personal relationships (Cai et al., 2010). For instance, Cai et al. (2010) found that *guanxi* had a significant and direct impact on information sharing, but not on collaborative planning, which is also consistent with our findings and supports our explanation as discussed above.

Another likely explanation is that a majority (over 80 %) of our data is from firms in the Southern and Eastern regions of China. In 1980, the Chinese government established Special Economic Zones (SEZs) in ShenZhen as a sort of test case for experimenting with its economic reform policy. Foreign investors in the SEZs received preferential treatment, when they established modern manufacturing facilities. Also, local governments and enterprises in the SEZs had more freedom to make economic decisions. Later on, the Chinese government extended these initial positive experiences in ShenZhen to include 14 coastal cities in the Southern and Eastern part of China. As a result, manufacturing activity had a high level of concentration in these areas. Consequently, the local economy developed more rapidly in these regions as compared to the middle and Western parts of China. This can also be illustrated via the following statistics: The GDP per capita in 2019 in Guangdong (USD 13,800) and in Zhejiang provinces (USD 15,800), are more than twice as high as GDP in GuiZhou (USD 6,800) and GanSu provinces (USD 4,800). GDP per capita of Shenzhen of around USD 13,000 in 2019, puts this province in the top 30 list of countries in the world. Studies on the Chinese economy often take regional differences into account, instead of treating China as a homogeneous country (Demurger, 2001). Fast economic development led to changes in government, legal systems, and local culture. As an important manufacturing center of the world, Chinese manufacturers became more involved in designing and implementing global supply chains (Fredendall, Letmathe, & Uebe-Emden, 2016). These firms learned how a market economy works, and how to compete in such an

economy (Flynn, Zhao, & Roth, 2007). During the process of development, firms have realized the limitations of informal and personal-oriented relationships, and increasingly relied on contractual relationships (Chatterji, Cunningham, & Joseph, 2019). The results of the integrated model provide some support for this idea. Yet, the influence of the *guanxi* oriented culture, points to initially building a relational connection. However, the initial relational posture could also lead subsequently to the building of a contractual posture. Such a contractual posture includes investment in specific assets, and in information sharing necessary for successful implementation of IOICT (Gong et al., 2018). This could be construed as a formal way of communicating expectations of the supply chain partners. Nevertheless, our results highlight the fact that the two postures are inter-connected, and in line with earlier arguments made by Cao and Lumineau (2015) and Chi et al. (2017) on the joint importance of both contractual and relational perspectives.

## 5.3. IOICT adoption in the Netherlands

In both the conceptual model and the integrated model, the effect of contractual posture on IOICT implementation was significant (respectively  $\beta = 0.51$ ,  $p = 0.002$ ; and  $\beta = 0.53$ ,  $p = 0.002$ ) whereas the effect of relational posture was insignificant ( $\beta = 0.15$ , ns; and  $\beta = -0.05$ , ns). This pattern of findings confirms H2, which stated that in the Dutch context, the contractual posture would contribute to IOICT implementation more than the relational posture. Although, it seems that contractual posture contributes to IOICT implementation more than relational posture in both countries, there are still clear differences. In the Chinese context, relational posture has an indirect impact on IOICT implementation. In contrast, in the Dutch context, relational posture does not relate to IOICT implementation or to contractual posture. A likely explanation is that the well-developed legal system in the Netherlands, encourages Dutch firms to rely on contracts in their long-term relationships (Handley & Angst, 2015). Arrighetti, Bachmann and Deakin (1997) found a similar explanation for Germany, a country which compares well to the Netherlands. Thus, first building a relational connection is not a necessary step in The Netherlands.

## 5.4. The relationship between IOICT implementation and SC performance

In both subsamples, IOICT implementation did not positively influence cost performance, whereas it did positively and significantly influence service performance. This could be because IOICT is mainly a device to improve delivery and service to the buyer, and reducing cost is less of an objective or priority. This also implies that IOICT does not seem to have an efficiency advantage. Possibly, given the cross-sectional nature of our data (resulting in a 'snapshot' of a phenomenon), the potential cost advantages from IOICT could have been captured in earlier stages of IOICT or even before implementing IOICT. For example, having centralized information exchange and pursuing paperless transactions may capture early and "low hanging fruits" type of benefits that are also, typically, achieved through IOICT. Beyond these early stage advantages, our findings mainly stress that the benefits associated with IOICT stem from key account management initiatives such as dedicating assets and programs to key customers that enable firms to use IOICT to improve service delivery outcomes.

## 6. Implications and limitations

### 6.1. Theoretical contributions and implications

This study has several theoretical implications. First, this paper attempts to respond to the call for empirical research on inter-organizational factors that influence IOICT implementation (Wei et al., 2015). While most prior research has focused on the intra-organizational level unit of analysis, the present study emphasizes the inter-organizational



level as the unit of analysis. Using key tenets from transaction cost economics theory and relational exchange theory, we capture two ways of building supply chain relationships: the contractual posture and the relational posture, and we investigate their impact on IOICT implementation. In doing so, this paper provides a multi-theory framework to understand IOICT implementation in buyer-supplier relationships. This framework is an extension of earlier research that seemed to suggest that successful IOICT implementation is an outcome that is mainly traced to a relational posture (Cheng, 2011). The findings of this paper also highlight the fact that IOICT implementation can benefit from an integrated view that includes both the contractual posture and relational posture (Chi et al., 2017; Mirkovski et al., 2016).

Secondly, this research provides a cross-country analysis by contrasting the importance of different cultural and economic contexts (Wei et al., 2015). To the best of our knowledge, this study is one of the first to investigate the influence of country-context on the company level mechanisms of IOICT implementation, by comparing supply chain relationships in two countries. As such, our findings strongly contribute to a better understanding of IOICT implementation in global supply chains. The results show that in the Dutch context, only the contractual posture significantly influences IOICT implementation, while in the Chinese context, both the contractual and relational posture significantly influence company level enablers of IOICT implementation. This finding supports the idea that firms in more mature and developed markets are more likely to rely on arm's length relationships and formal communication modes (Cai & Yang, 2014; Cannon et al., 2010; Handley & Angst, 2015). These differences between the two countries also emphasize the need for more cross-country research on enablers of IOICT at the inter-organizational level. Furthermore, we find that the contractual posture also plays a more important role than the relational posture in Chinese firms, which is in contrast with the prevailing view that informal ways to govern business transactions are more popular in Chinese companies (Feng, Yu, Chavez, Mangan, & Zhang, 2017; Peng, Wang, & Jiang, 2008). In line with our findings, more recent research points out that along with the fast and ongoing development of the Chinese economy, societal aspects and national culture aspects also change (Cai et al., 2010).

Thirdly, our empirical results confirm prior research that the contractual posture is a key element to be considered for IOICT implementation. Even in the Chinese context, our post-hoc analyses revealed that the contractual posture fully mediated the impact of relational posture on IOICT implementation, indicating that contractual posture did play a role in this context as well. This finding might partly explain the insignificant relationship between trust and IOICT as indicated in previous studies (Chong & Bai, 2014; Chong et al., 2009), as trust is generally based more on relational norms. Finally, the results emphasize the benefits of adopting multi-theoretical perspectives in supply chain management research.

## 6.2. Implications for practice

In terms of practical implications, this research highlights the fact that managers should pursue integrative practices that are based on both contractual and relational postures for effective IOICT implementation. The contractual posture could include practices such as asset specific investments, and safeguards for such investments, examples of which from our study include customized logistics assets and information sharing. Information sharing or specifically, an information sharing culture also enhances IOICT connectivity in supply chains (Cheng, 2011; Wang, Childerhouse, Kang, Huo, & Mathrani, 2016). Decision makers in a manufacturing context should obtain consensus on information sharing with key partners relating to production plans, changes therein as well as share forecast and inventory information. Many failures of IOICT implementation in supply chains can be traced to the fact that adoption of IOICT did not automatically result in actual information sharing between partners on production plans, forecasting

and inventory information, which is arguably a vital aspect of the success of IOICT. Our findings strongly suggest that an information sharing culture is the cornerstone of successful IOICT implementations. Furthermore, managers should also recognize that appropriate investments could also benefit IOICT implementation. In fact, in a recent study, managers reported that the biggest challenge faced in IOICT implementation is business process cooperation between firms (Wei et al., 2015). Asset specificity through customized logistics assets can help suppliers get familiar with the operational practices of customers, which can enhance the potential success of IOICT implementation. In other words, rather than seeing an IOICT investment as an isolated decision, it seems to be that IOICT needs to be embedded in a set of practices and operational activities that each separately help to improve performance. Moreover, such activities are more effective when applied jointly.

This research showed that, in an era of globalization, countries do differ with respect to IOICT implementation at the company level. Therefore, companies should take into account the regions that they are operating in when it comes to IOICT implementation. In China, firms need to make a solid case with suppliers to encourage and prepare for their early involvement in IOICT implementation. Thus, both relational investments and contracts are needed. In contrast, in The Netherlands, implementing IOICT appears to be better done through formal mechanisms such as contracts, as opposed to through relationships. However, our research also suggests that for Chinese managers' relational investments are just a preliminary step towards building relationships in order to help locate trustworthy trading partners. Finally, IOICT implementation can be regarded both as an end goal in itself, and as a way to consolidating a contractually-oriented relationship. These different approaches in different countries towards improving supply chain effectiveness might also be applied for other business practices and programs. This will make for a counter case for the desire towards implementing programs on a global basis using the same uniform approach. One of such programs to be reconsidered by managers might be lean implementation, which might also be influenced by country-specific socio-economic characteristics.

## 6.3. Limitations and future research directions

As is the case with all research studies, this study also has limitations. First, we only compared two countries, and did not explicitly take socio-economic factors into account in our empirical analysis in order to measure the moderating role of these factors directly. For example, we did not explicitly measure nor take into account the role of cultural dimensions or economic and institutional factors. Relating to the limitation of comparing only two countries, and not explicitly including socio-economic factors, it might also be true that our findings are restricted to be valid for only the two countries that were compared in this study. While this somewhat limits the scope of our findings, there is still value given the size of the Chinese manufacturing sector, and the many trade relations that exist with companies from other countries. In addition, based upon economic, cultural, and institutional factors, China and Netherlands represent a large group of countries in the global economy realm. Second, this study discusses IOICT in supply chains across two countries, but did not consider other contextual and related factors such as demand uncertainty, supply chain complexity or organizational culture. Finally, our study examined IOICT implementation using cross sectional (survey) data that may not capture the full dynamics and complexities involving different stages of IOICT implementation from launch to execution (Wei et al., 2015). At best, our view represents a 'snap shot' of IOICT implementation.

Corresponding to the limitation of this study, future research could expand on our study both in terms of explicitly measuring the moderating role of cultural, economic and institutional factors. Such an approach can also benefit from extending the research to include more countries than just two, although the present two countries have been

instrumental in detection typical differences. This could help detect the influence of specific socio-economic factors within these countries and also help to further understand which economic, cultural, and institutional factors are most important or even directly interact with our variables of interest. Moreover, factors that are enablers or barriers for the implementation of IOICT, and other supply chain processes between trading partners across countries could be examined more closely in such research. Furthermore, previous studies have shown that demand uncertainty and supply chain complexity could hinder an organization's willingness to utilize information technology (Sinkovics & Kim, 2014), while organizational culture could play a role within an organization. Thus, future research could consider the impact of such factors on IOICT implementation. Finally, future research could collect longitudinal data to investigate the dynamic relationships between predictive variables and dependent variables based on the life cycle stage of IOICT implementation.

## 7. Conclusions

The objective of this study was to isolate and investigate specific mechanisms that explain IOICT implementation across different country contexts. Building on arguments from transaction cost theory and relational exchange theory, we developed an inter-organizational theoretical perspective on IOICT implementation. We found that IOICT is supported by the joint and relative roles of contractual postures versus relational postures in IOICT. However, the specific roles tend to depend on country contexts. Considering these disparate mechanisms explicitly and separately is an important contribution of our study. Often inter-organizational relationships are seen as an integrated concept. However, this study shows that the preceding mechanisms of relationship building and development should be considered while investigating potential enablers.

As hypothesized in this study, our findings supported a larger prevalence of a contractual posture over a relational posture for the Dutch subsample. However, our hypothesis that the relational posture would be stronger in the China subsample as compared to the Netherlands subsample was not supported. Although the effect of the contractual posture on IOICT implementation in China is larger than the effect of the relational posture, we find that in China the relational posture also does play a role. Specifically, the additional post-hoc analyses show that the impact of the relational posture is actually mediated through the contractual posture.

Interestingly, we find that IOICT mainly has a positive influence on service performance in both countries but not on cost performance. This suggests that IOICT is specifically a means for faster provision of information, and increases speed of dissemination, as opposed to a means of increasing efficiency.

## CRedit authorship contribution statement

**Xuan Zhang:** Data curation, Formal analysis, Methodology, Writing - original draft. **Dirk Pieter van Donk:** Conceptualization, Supervision, Writing - original draft, Writing - review & editing. **Jayanth Jayaram:** Writing - review & editing.

## Declaration of Competing Interest

None.

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## Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.ijinfomgt.2020.102191>.

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